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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
BRANNOCK, MICHAEL T	
ART UNIT	**PAPER NUMBER**
1646	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
09/747,155	Rouquler et al.
Examiner	**Art Unit**
Mi hael Brannock, Ph.D	1646

-- The MAILING DATE of this communication app ars on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on Jun 5, 2002

2a) ☐ This action is **FINAL.** 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) 1-20 is/are pending in the applica

4a) Of the above, claim(s) 9, 10, and 12-20 is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) 1-8 and 11 is/are rejected.

7) ☐ Claim(s) _____ is/are objected to.

8) ☒ Claims 1-20 are subject to restriction and/or election requirem

Application Papers

9) ☒ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☒ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

Status of Application: Claims and Amendments

1. Claims 1-20 are pending.

2. Applicant is notified that the amendments put forth in Paper 4, 8/9/01, have been entered in full.

3. Claims 9, 10, 12-20 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. As no arguments were presented as to why the restriction requirement might be improper, Applicants election to prosecute the claims of Group I, claims 1-8 and 11, in Paper No. 10, 6/19/02, is treated as an election without traverse.

Applicant traverses the species election requirement. Applicant clearly admits on the record that all derivatives of the olfactory receptor (ORX) superfamily of nucleotides and proteins, i.e. those obtained by using PCR consensus ORX primer pairs OR5B-OR3b and OR3.1-OR7.1, are not individually distinct and independent (Paper 10, page 2). Thus, for the purposes of this Office action, all such derivatives shall be treated as obvious variants of each other.

Specification

4. The disclosure is objected to because of the following informalities: the numbering of the polypeptide and polynucleotide sequences in the specification does not match that of the Raw Sequence listing, e.g. the specification indicates that SEQ ID NO: 224 is a polypeptide sequence (pg 121), whereas the RSL indicates that SEQ ID NO: 224 is a polynucleotide sequence.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

5.The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claims 1-8 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claims require an "ORX" nucleic acid or polypeptide, yet the specification does not define the term "ORX" such that one skilled in the art would no what is and what is not an "ORX" nucleic acid or polypeptide". At page 222, the specification indicates that "ORX" nucleic acid or polypeptide specifically refers to the sequences in GenBank accession numbers AF022649, AF073959-073989, AF1278814-127907, and AF179716-179843, this statement implies, but does not stipulate, that only those specifically described nucleic acids or proteins are to be considered "ORX" nucleic acids or polypeptides. The specification also appears to indicate that other sequences not specifically disclosed in GenBank accession numbers AF022649, AF073959-073989, AF1278814-127907, and AF179716-179843 are also considered "ORX" nucleic acids or polypeptides, see for example page 229 L10-23 and page 230 L24-30. Applicant has argued in Paper 10 (page 2) that the disclosed sequences are representative of the ORX gene repertoire, thus suggesting that there are, or could be, other "ORX" nucleic acids or polypeptides not disclosed. As the claims now read, it is impossible to determine if the recited "ORX" nucleic acids or polypeptides include only those disclosed as GenBank accession numbers AF022649,

AF073959-073989, AF1278814-127907, and AF179716-179843, thus it is impossible to determine the metes and bounds of the claims.

Claim 2 and claim 9 (from which elected claim 11 depends) require that the nucleic acid hybridize under stringent conditions. The term "stringent conditions" is confusing because it is a relative term and encompasses conditions of varying degrees of stringency - such conditions determining the bounds of the claim. However, the art does not provide an unambiguous definition of the term "stringent conditions" and neither is such a definition given for the term in the specification (e.g. pg 236) which puts forth the metes and bounds of the claim Applicant is seeking protection for. It is suggested that the claim recite the actual conditions that applicant considers to be stringent, i.e., salt concentration and temperature conditions of incubations and washes.

Claim 2 recites "or the complement of said nucleic acid molecule", however, as there appears to be more than one "nucleic acid molecule" recited in the claim, the artisan cannot determine which "nucleic acid molecule" is being claimed, i.e., the "nucleic acid molecule" recited in line 1 of the claim does not appear to be the same "nucleic acid molecule" recited in line 2 of the claim.

Claim 3 requires one or more "conservative substitutions" in a "ORX" polypeptide. The term "conservative substitution" is used in the art as a relative term and there is no art-established list of substitutions that are unambiguously considered to be conservative, and neither is such

provided in the specification (e.g. page 239). Thus the metes and bounds of the claim cannot be determined.

Claim 9 (from which elected claim 11 depends) require derivatives, analogous and homologs of a ORX polypeptide. The terms "derivative", "analogue" and "homolog" render the claims indefinite because the specification does not provide guidelines for establishing the degree of derivation or homology required by the claim, and nor can the metes and bounds of these terms be ascertained when read in light of the specification. At pages 232-233 and 247 these terms are defined by way of examples, yet examples cannot define the bounds of a claim. One of ordinary skill in the art, would not be reasonably apprised of the metes and bounds of the invention.

Claim Rejections - 35 USC § 101

7. 35 U.S.C. 101 reads as follows:

> Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

8. Claims 1-8, 11 are rejected under 35 U.S.C. § 101 because the claimed invention is not supported by either a specific and substantial asserted utility or a well-established utility. The claims are directed to polynucleotides encoding polypeptides asserted to be odorant receptor proteins (ORX). The instant specification puts forth that the polypeptides are useful in a

screening method to determine what ligands may activate or inhibit the polypeptide (e.g. pages 278-285) and also to determine what the physiological effects of the polypeptide might be, e.g. in olfaction, or modulating angiogenesis or neuronal development (see page 229 for example). This proposed use lacks a specific and substantial utility. It is not a specific use because any integral membrane protein could be used in exactly the same way. Further, many polypeptides are known in the art, yet the polypeptides have no known function or known ligands. Any of these orphan clones could be used in the manner described in the specification for the claimed polypeptide.

Furthermore, the proposed use of the polypeptide to screen for ligands of the polypeptide or for biologic effects of the polypeptide is not a substantial utility. A substantial utility is a practical use which amounts to more than a starting point for further research and investigation and does not require or constitute carrying out further research to identify or reasonably confirm what the practical use might ultimately be. For example, an assay that measures the presence of a material which has a stated correlation to a predisposition to the onset of a particular disease condition would be a practical use of the material. However, a method of treating an unspecified disease or condition with a material that has no particular correlation with a disease would not constitute a substantial utility. Basic research, such as studying the properties of the claimed product or the mechanisms in which the product is involved, does not constitute a substantial utility.

The specification puts forth that the polypeptide could be involved in any number of disparate disease states, e.g. neurodegenerative, cell proliferative, angiogenic, hematopoietic, immunological, inflammatory and tumor-related disorders, and could therefore be used as a diagnostic or therapeutic agent (see page 286, for example). A stated belief that a correlation exists between the polynucleotides or polypeptides and any number of diseases is not sufficient guidance to use the claimed polynucleotides to treat and/or diagnosis a particular disease; it merely defines a starting point for further research and investigation.

This application claims a method for measuring olfactory acuity in an individual (e.g. claim 15) by determining the ratio of ORX genes containing open reading frames vs ORX psuedogenes. This method has been used by the inventors to provide the suggestion that differences in olfactory acuity among different species of animals could be explained by the relative amounts of olfactory-receptor-gene deactivation (see page 227). While these findings are unquestionably of significant interest to the scientific community, it is unclear how this hypothesis can be used in a way that constitutes a substantial utility. Further, the instantly claimed products, i.e. polynucleotides encoding ORX polypeptide are not claimed to be required for the method.

The specification puts forth that the polynucleotides and polypeptides could be used as tissue specific or chromosomal markers, e.g. page 285. Consistent with current examination guidelines, use as a tissue specific and/or chromosomal marker is not considered to be a substantial utility. Most every polypeptide exhibits some tissue specific pattern of expression

and most every gene encoding a polypeptide is localized to some region of a chromosome. However, without some assertion that the tissue or chromosomal localization can be used to practice a particular substantial utility, as in a marker for a particular disease state, the use of the polypeptides or polynucleotides as tissue or chromosomal marker does not constitute a substantial utility.

The specification puts forth that the polypeptide and/or polynucleotides could be used in forensic biology (e.g. page 293). However the specification does not teach that any particular nucleic acid or amino acid sequence is distinctive of any individual. While one of skill in the art would appreciate that there may exist polymorphisms in the disclosed sequences, this amounts to nothing more than an invitation to the skilled artisan to try and find such polypmorphisms if they exist.

The specification puts forth that the polypeptide or polynucleotide could be used as part of a micro-array for drug screening (see page 292). These purposed uses are not substantial utilities because each use amounts to no more than an invitation to study the properties of the polynucleotides or polypeptides, e.g. to determine whether a compound alters the expression of the polypeptide, and then to determine what, if any, the consequence of that alteration may be, or also to determine what ligands might bind to the polypeptide, e.g. drug screening. Such an invitation to perform research on the claimed polynucleotide is not a substantial utility.

The instant application has failed to provide guidance as to how one of skill in the art could use the claimed invention in a way that constitutes a specific or substantial utility. The

proposed uses of the claimed invention are simply starting points for further research and investigation into potential practical uses of the claimed nucleic acids.

9. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 1-8, 11 are also rejected under 35 U.S.C. § 112 first paragraph. Specifically, since the claimed invention is not supported by either a specific and substantial asserted utility or a well established utility for the reasons set forth above, one skilled in the art would not know how to use the claimed invention so that it would operate as intended without undue experimentation.

Furthermore, the claims encompass polynucleotides encoding polypeptide variants of the disclosed polypeptides, i.e. substitutions, deletions or insertions in a protein corresponding to a disclosed polypeptide; should Applicant establish a specific and substantial utility for the claimed polynucleotides, Applicant has not provided sufficient guidance as to how to make and use the encoded polypeptides which are not 100% identical to the disclosed polypeptides, but which still retain a desired property of the polypeptides. The claims require polypeptides comprising only portions of those disclosed. The claims require polynucleotides encoding polypeptides having a recited degree of identity with any polypeptide that can be termed and ORX polypeptide. Thus, the vast majority of polypeptides are amino acid sequence variants of the ORX polypeptides, yet

the specification has failed to teach one of skill in the art which amino acid substitutions, deletions or insertions to make. Furthermore, the Applicant has not provided guidance as to what properties of the allelic variants or sequence variants of the protein corresponding to the disclosed polypeptides might be desired nor any guidance as to which amino acid substitutions, deletions or insertions to make to achieve any desired property. Applicant has not defined a difference in structure or difference in function between any disclosed polypeptide and a variant of the polypeptide. If a variant of the protein is to have a structure and function similar to the disclosed protein, then the specification has failed to teach one of skill in the art which amino acid substitutions, deletions or insertions to make that will preserve the structure and function of the parent protein. Conversely, if a protein variant need not have a disclosed property, the specification has failed to teach how to use such a variant.

The specification has failed to provide an activity of any of the disclosed polypeptides to be used to evaluate the claimed variants for usefulness, i.e. the specification has provided only the assertion that the polypeptides are odorant receptors, yet the specification has not taught which odorants bind to any receptors. Nor has the specification provided any guidance as to which odorant/receptor combinations should be expected, and nor is such known in the art. The specification provides merely an invitation to the skilled artisan to try to find particular odorants that bind to and activate a particular receptor (pgs 278-285). This level of experimentation is far from routine for any orphan receptor and particularly so for odorant receptors. Zhao et al. Science 279(237-242)1998 teach that although the odorant receptors may signal through a

common motif, the putative odorant receptors constitute the largest subfamily of GPCRs, and in some ways remain the most enigmatic, because no particular mammalian receptor has been definitively paired with any ligand (see page 237, col 1). The specification has not provided a working example of the use of a variant of the polypeptide of any of the disclosed polypeptides nor sufficient guidance so as to enable one of skill in the art to make such a variant.

The problem of predicting protein structure from sequence data and in turn utilizing predicted structural determinations to ascertain functional aspects of the protein is extremely complex. While it is known that many amino acid substitutions are generally possible in any given protein, the positions within the protein's sequence where such amino acid substitutions can be made with a reasonable expectation of success are limited. Certain positions in the sequence are critical to the protein's structure/function relationship, e.g. such as various sites or regions directly involved in binding, activity and in providing the correct three-dimensional spatial orientation of binding and active sites. These regions can tolerate only relatively conservative substitutions or no substitutions (see Bowie et al., 1990, Science 247:1306-1310, especially p.1306, column 2, paragraph 2). However, Applicant has provided little or no guidance beyond the mere presentation of sequence data to enable one of ordinary skill in the art to determine, without undue experimentation, the positions in the protein which are tolerant to change (e.g. such as by amino acid substitutions or deletions), and the nature and extent of changes that can be made in these positions. Also, these or other regions may be critical determinants of antigenicity. It is well appreciated in the art of antibody production that it is

unpredictable which amino acids are critical antigenic determinants (see Alexander et al., Proc. Natl. Acad. Sci. 89(3352-3356)1992. Protein antigenicity can be significantly reduced by substitution of even a single residue. Further, even if an amino acid substitution does not destroy the activity of the immunizing protein, the substitution may significantly reduce the antigenicity of the protein (see the Abstract of Alexander et al.). The specification does not provide sufficient guidance as to how to make antibodies that are specific to variants of the disclosed polypeptides that can be used for any specific purpose.

Although the specification outlines art-recognized procedures for producing variants (e.g. pages 245 and 279), this is not adequate guidance as to the nature of active variants that may be constructed, but is merely an invitation to the artisan to use the current invention as a starting point for further experimentation. Even if an active or binding site were identified in the specification, they may not be sufficient, as the ordinary artisan would immediately recognize that an active or binding site must assume the proper three-dimensional configuration to be active, which conformation is dependent upon surrounding residues; therefore substitution of non-essential residues can often destroy activity.

Due to the large quantity of experimentation necessary to generate the infinite number of variant recited in the claims and possibly screen same for activity, the lack of direction/guidance presented in the specification regarding which structural features are required in order to provide activity, the absence of working examples directed to same, the complex nature of the invention, the state of the prior art which establishes the unpredictability of the effects of mutation on

protein structure and function, and the breadth of the claims which fail to recite any structural or functional limitations, undue experimentation would be required of the skilled artisan to make and/or use the claimed invention in its full scope.

Claim Rejections - 35 USC § 102 and ***35 USC § 103***

10. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

11. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

12. Claims 1-8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Freitag et al., Neuron, 15(1383-1392)1995.

As set forth above, it is unclear whether the instant claims encompass only those polynucleotides as disclosed in GenBank accession numbers AF022649, AF073959-073989,

AF1278814-127907, and AF179716-179843, and variants thereof, or other polynucleotides that can be termed ORX polynucleotides that can be obtained as taught in the specification using the PCR primers disclosed (page 223) and as argued by Applicant in Paper 10 (page 2).

The specification indicates that the claimed ORX polynucleotides can be obtained by PCR amplification of genomic DNA using the primers OR3.1-OR7.1, see p 223, for example. Freitag et al. teach the amplification of genomic DNA using the primers OR3.1-OR7.1, see page 1390 col 2: PCR.

Further, regardless of the interpretation of the claims, discussed above, Applicant has clearly admitted on the record that all derivatives of the olfactory receptor (ORX) superfamily of nucleotides and proteins, i.e. those obtained by using PCR consensus ORX primer pairs OR5B-OR3b and OR3.1-OR7.1, are not individually distinct and independent (Paper 10, page 2); thus the instantly claimed polynucleotides cannot be patentably distinct from those disclosed by Freitag et al.

13. Claims 1-8 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Ben-Arie et al., Human Molecular Genetics 3(2)229-235, 1994.

As set forth above, it is unclear whether the instant claims encompass only those polynucleotides as disclosed in GenBank accession numbers AF022649, AF073959-073989, AF1278814-127907, and AF179716-179843, and variants thereof, or other polynucleotides that

can be termed ORX polynucleotides that can be obtained as taught in the specification using the PCR primers disclosed (page 223) and as argued by Applicant in Paper 10 (page 2).

The specification indicates that the claimed ORX polynucleotides can be obtained by PCR amplification of genomic DNA using the primers OR5B-OR3B, see p 223, for example. Ben-Arie et al. teach the amplification of genomic DNA using the primers OR5B-OR3B, see page 234, MATERIALS AND METHODS.

Further, regardless of the interpretation of the claims, discussed above, Applicant has clearly admitted on the record that all derivatives of the olfactory receptor (ORX) superfamily of nucleotides and proteins, i.e. those obtained by using PCR consensus ORX primer pairs OR5B-OR3b and OR3.1-OR7.1, are not individually distinct and independent (Paper 10, page 2); thus the instantly claimed polynucleotides cannot be patentably distinct from those disclosed by Ben-Arie et al.

14. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Freitag et al., Neuron, 15(1383-1392)1995 or Ben-Arie et al., Human Molecular Genetics 3(2)229-235, 1994, in view of Kiefer et al., Biochemistry 1996, 35:16077-16084.

Both Freitag et al. and Ben-Arie et al. teach the ORX polynucleotides, as discussed above regarding claims 1-8, as well as the deduced amino acid sequences of the encoded odorant receptor proteins, yet they do not teach expression of the polypeptides in host cells. Kiefer et al.,

teach the expression and isolation of cloned olfactory receptor proteins in host cells, see the Abstract.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made, with reasonable expectation of success, to produce the encoded odorant receptor polypeptides taught by either Freitag et al. or Ben-Arie et al using the method taught by Kiefer et al.. The motivation to do so was provided by Kiefer et al. who teaches that such method is useful for the production of olfactory receptor peptides for biophysical and screening studies (see the Abstract).

Conclusion

15. No claims are allowable.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Brannock, Ph.D., whose telephone number is (703) 306-5876. The examiner can normally be reached on Mondays through Thursdays from 8:00 a.m. to 5:30 p.m. The examiner can also normally be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yvonne Eyler, Ph.D., can be reached at (703) 308-6564.

Official papers filed by fax should be directed to (703) 308-4242. Faxed draft or informal communications with the examiner should be directed to (703) 308-0294.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0196.

MB

August 24, 2002

YVONNE EYLER, PH.D
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1600